

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

The status of applicant's parent application has now been updated at page 1 of the specification as requested.

The claims have been amended so as to avoid use of the term "conventional".

Claims 60-63 have now been cancelled without prejudice or disclaimer thus mooted all outstanding grounds of rejection for these claims.

The rejection of claims 56-59 and 64-67 under 35 U.S.C. §103 as allegedly being made "obvious" based on Miyazaki et al. '377 in view of Dumoulin '660 is respectfully traversed.

Miyazaki '377 does, of course, teach the use of MT pulses. While the Examiner has acknowledged that Miyazaki "fails to disclose the use of non-selective MT pulses", it is important to note that the teaching of Miyazaki '377 (like that of all other prior art involving MT pulses) specifically teaches only the use of selective MT pulses. That is, Miyazaki '377 teaches something that is directly contrary to the applicant's claimed invention which requires the use of non-selective MT pulses.

To supply this admitted deficiency in Miyazaki '377, the Examiner relies upon Dumoulin '660 which the Examiner alleges to disclose in column 5 that the use of non-selective or selective "pulses" are well known in the art depending only upon "whether or not one wants to limit the volume to which the pulses are applied".

However, the Examiner's assertions totally ignore any distinctions between MT pulses and generic "pulses" of any sort. Furthermore, the Examiner admits that use of non-selective or selective "pulses" must depend upon whether or not one wants to limit the volume to which the pulses are applied. Accordingly, even under the Examiner's reasoning, unless there is some teaching or suggestion in the prior art that would lead one to want to limit the volume to which MT pulses are applied, then there clearly can be no teaching or suggestion of the applicant's claimed invention. Indeed, in making this analysis, it is also important to keep clearly in mind that explicit prior art teaching with respect to MT pulses is directly to the contrary. That is, the prior art teaches only that one wants to limit the volume to which MT pulses are applied. There is no known teaching or suggestion anywhere in the prior art that one, for any reason, might want to not limit the volume to which MT pulses are applied.

Dumoulin uses an inversion pulse to practice the inversion recovery technique. The inversion recovery technique relies upon a difference between spin inversion times. Thus RF pulses for the inversion recovery technique have a frequency to excite water protons and achieve a 180° flip angle.

In contrast, the applicant's claimed MT pulse is set to have a flip angle of 90 to 100 degrees. The applicant's MT pulse technique relies upon a difference between the resonance frequencies of free water protons and macromolecules – not on a difference between spin inversion recovery times. In addition, when using the MT pulse technique, the frequency of RF pulses is set to a value separated from the resonance frequency of protons of free water (i.e., off-resonance).

That is, the Dumoulin inversion recovery technique totally differs in technical concept from the MT pulse technique. For example, one practical difference appears in the differing RF frequencies and flip angles.

Although the Examiner only refers generally to column 5 of Dumoulin '660, it is presumed that the Examiner is primarily relying upon column 5, lines 29-42 which are quoted below in full for the convenience of the Examiner:

“Pulse sequence 100 consists of a non-selective inversion radio frequency (RF) pulse 110 which substantially inverts all spin magnetization within the excitation radio frequency coil of the imaging systems. In the present embodiment of the invention inversion RF pulse 110 is applied without the simultaneous application of a magnetic field gradient pulse. If it is desirable to restrict the volume of inversion, a magnetic field gradient pulse can be applied simultaneously with an inversion pulse in a manner well known to those skilled in the art.”

As is clearly apparent from the explicit language of Dumoulin quoted above, the only teaching about optional use of selective or non-selective “pulses” there made is with respect to inversion pulses. There is clearly no teaching or suggestion whatsoever that it would be desirable for any reason to use non-selective MT pulses. Indeed, Dumoulin '660 is really irrelevant in its entirety with respect to MT pulse sequences.

In fact, the use of non-selective MT pulses is not in any way taught or suggested by any of the cited references and was not previously “well known”. Indeed, to the extent that the cited prior art is relevant to the use of MT pulses, it specifically teaches to the contrary – and thus vividly illustrates the non-obviousness and patentability of the applicant’s claimed invention.

Dependent claims 57-59 and 65-67 add yet further patentable distinction to the applicant’s claimed invention.

KASSAI et al.
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Similarly, new dependent claims 68 and 69 also add yet further patentable distinction to the applicant's claimed invention.

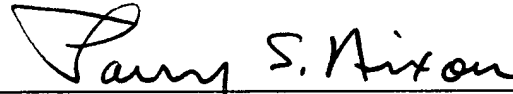
Attention is also directed to new claims 70-74 of which, independent claim 70 also requires applying at least one non-selective MT pulse to an object imaging region. Dependent claims 71-74 add yet further patentable distinction to the claimed invention.

Accordingly, this entire application is now believed to be in allowable condition and a formal Notice to that effect is respectfully solicited.

Respectfully submitted,

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